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(54) Valve block

(57) A valve block for a glass container forming machine comprises a frame supporting a plurality of valve stations. Each of the stations is provided with a valve. The frame comprises pressure passages connected to supplies of compressed air, and control sleeves at each station determine which supply is available to the valve at that station. The valves and the control sleeves are all accessible from one face of the valve block.

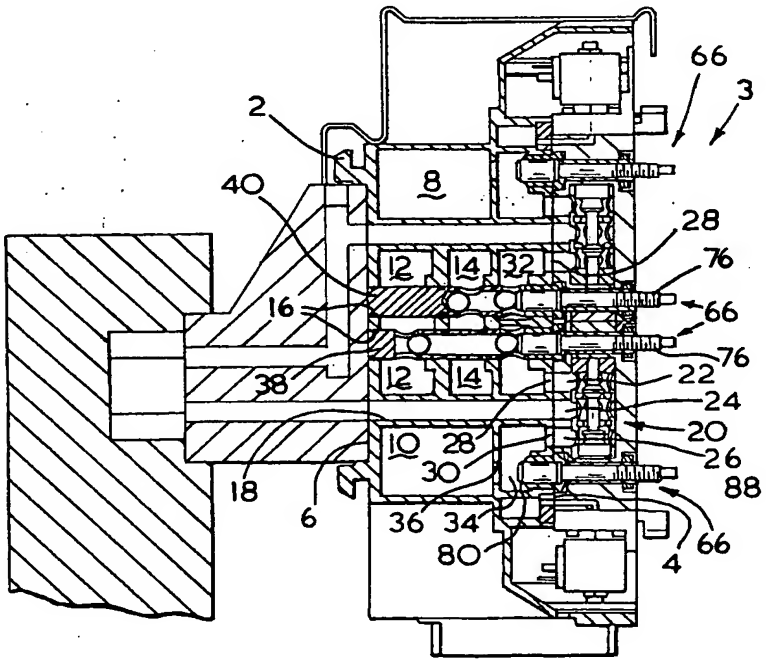

FIG. 2

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D scription

This invention relates to valve blocks.

Conventional glassware forming machines of the I. S. or individual section type comprise a plurality of sections, mechanically similar, operating out of phase with each other to produce a continuous stream of glass containers. Each section comprises a number of pneumatically operated mechanisms and each such mechanism comprises one or more pneumatic valves to control its op rating sequence. Such pneumatic valves are normally controlled by solenoid operated pilot valves, which solenoid operated valves are controlled by a computerised control system for the machine.

Conveniently the pneumatic valves and the associated solenoid operated pilot valves for a single section are mounted in an array in a valve block which is mounted on the section, and significant constraints are placed upon the design of such valve blocks by the need to accommodate it in the space available in the width of one section and also by the need to make it reasonably accessible for repair and adjustment.

A typical valve block is shown in US 3 918 489. This valve block comprises two castings secured together, one casting supporting the solenoid operated pilot valves in an array comprising two lines of such valves, and the other casting supporting the pneumatic valves associated with the pilot valves. To gain access to the pneumatic valves, for repair or adjustment, it is necessary to separate the two castings, which is a very time consuming operation.

It is one of the aspects of the present invention to provide a valve block which is economical in construction and in which access to component parts for repair or modification is facilitated.

The present invention provides a valve block comprising

a frame which provides a plurality of valve stations arranged in one or more rows, the frame having a front face and a rear face which provide a front face and a rear face of each valve station, an exhaust passage, a first pressure passage and a second pressure passage all extending lengthwise through all the valve stations in one row, and a valve associated with each valve station

characterised in that each valve station comprises

an inlet passage extending from the rear face to the front face of the station across the two pressure passages
a supply passage extending from the rear face to the front face of th station
a control sle ve in the inlet passag which connects a selected one only of the pressure passages to an inlet of th control valve which control sle ve is accessible from the front face of the valve station and in that th control valve associated with the station is mounted on the front face of the station
and throttle valves for controlling the passage of air to the valve from the inlet passage and from the valve to the exhaust passage are also mounted on the front face of the station.

The present invention also provides a valve block comprising

a frame which provides a plurality of valve stations arranged in one or more rows, the frame having a front face and a rear face which provide a front face and a rear face of each valve station and an exhaust passage, a first pressure passage and a second pressure passage all extending lengthwise through all the valve stations in one row, a control valve associated with each valve station and means for connecting the valve to the exhaust passage and selectively to one of the pressure passages
characterised in that
each valve station comprises

an inlet passage extending from the rear face to the front face of the station across the two pressure passages
a supply passage extending from the rear face to the front face of the station
a valve inlet passage extending from the front face of the station and connected to the inlet passage
a valve exhaust passage extending from the front face of the station and connected to the exhaust passage
a control sleeve in the inlet passage which connects a selected one only of the pressure passages to the valve inlet passage
the control valve associated with the valve station being mounted on the front face of the valve station and comprising air passages which mate with the entrances in the front face of the supply passage, the valve inlet passage and the valve exhaust passage.

The present invention further provides a valve block comprising

a frame which provides a plurality of valve stations arranged in one or more rows, the frame having a front face and a rear face which provide a front face and a rear face of each valve station and an exhaust passage, a first pressure passage and a second pressure passage all extending lengthwise through all the valve stations in one row, and a control valve associat d with each valve station,
characterised in that
ach valve station comprising

an inlet passage extending from the rear face to the front face of the station across the two pressure passages
a supply passage extending from the rear face to the front face of the station
a valve inlet passage extending from the front face of the station and connected to the inlet passage
a valve exhaust passage extending from the front face of the station and connected to the exhaust passage
a control sleeve in the inlet passage which connects a selected one only of the pressure passages to the valve inlet passage
a first stud arrangement mounted on the front face of the station and extending into the inlet passage to hold the control sleeve in position
a second stud arrangement mounted on the front face of the station
the valve being located on the two stud arrangements and comprising air passages which mate with the entrances in the front face of the supply passage, the valve inlet passage and the valve exhaust passage.

There now follows a description, to be read with reference to the accompanying drawings, of a valve block embodying the invention.

In the accompanying drawings,

Figure 1 shows a perspective view, with some parts removed, of a valve block embodying the invention;
Figure 2 shows a view of a section taken along the line II-II of Figure 1;
Figures 3 and 4 show control sleeves; and
Figure 5 shows a view similar to Figure 2 but comprising a different arrangement of control sleeves.

The valve block (Figure 1) comprises a frame 2 which provides a plurality, namely 26, of valve stations 3 arranged in one or more, in fact in two, rows.

The frame 2 is rectangular in shape and has a front face 4 and a rear face 6, which provide a front face and a rear face for each valve station.

Figures 2 and 5 each show a transverse section through two valve stations. The frame 2 comprises extending lengthwise through the frame, two exhaust passages 8 and 10, a first, high, pressure passage 12 and a second, low, pressure passage 14. The exhaust passages 8 and 10 are each associated with the valve stations in separate rows; viewing Figure 2 the passage 8 extends lengthwise through all the valve stations in the upper row of valve stations, the passage 10 through all the valve stations in the lower row. The passages 12 and 14 each extend through both rows of valve stations.

The lower valve station 3 shown in Figure 2 will now be described: it will be understood that the construction of each valve station 3 in the lower row is the same so far as the frame 2 is concerned, while the construction of each valve station 3 in the upper row is effectively the same as those in the lower row, being mirror images. The precise configuration of parts associated with the frame at each valve station may differ, as will be explained later.

The lower valve station 3 comprises an inlet passage 16 which extends directly from the rear face 6 to the front face 4 across the two pressure passages 12 and 14. A supply passage 18 also extends from the rear face 6 to the front face 4 of the station.

Associated with the valve station 3 is a pilot air operated control valve 20 which comprises connecting air passages namely an inlet 22, a supply outlet 24 and an exhaust outlet 26. The valve 20 is mounted on the front face 4. The inlet 22 mates with a valve inlet passage 28 of the frame 2, the supply outlet 24 with the supply passage 18, and the exhaust outlet 26 with a valve exhaust passage 30 of the frame 2. The valve inlet passage 28 leads from the face 4 to a chamber 32 which is open to the inlet passage 16. The valve exhaust passage 30 leads from the face 4 to a chamber 34 which opens through an orifice 36 into the exhaust passage 10.

The valve station 3 also comprises a control sleeve in the inlet passage 16 which determines whether the valve inlet passage 28 is connected to the high pressure passage 12 or the low pressure passage 14.

In Figure 2, the lower valve station 3 has a control sleeve 38 which connects the valve inlet passage 28 of that station to the high pressure passage 12, while the upper valve station 3 has a control sleeve 40 which connects the valve inlet passage 28 of that station to the lower pressure passage 14.

The sleeve 38, which may be termed a high pressure sleeve, is shown in Figure 3. It is tubular in form and comprises a closed end 42 from which extends a cylindrical wall 44 to an open end 50. Four radially spaced entry ports 46 are provided in the wall 44 close to the closed end 42. Similar ports 48 are provided adjacent the open end 50 of the wall 44; the end 50 provides an annular end face 52.

The sleeve 40, which may be termed a low pressure sleeve, is shown in Figure 4. It resembles the sleeve 38 being tubular in form, and comprises a thick closed end 54 from which a cylindrical wall 56 extends to an open end 62. Radially spaced entry ports 58 are provided in the wall 56, adjacent the closed end 54 and similar entry ports 60 are provided adjacent the open end 62 of the wall 56 which provides an annular end face 64.

The control sleeves are held in position in the frame 2 by stud arrangements 66 mounted on the front face 4 of the valve station 3, (best seen in Figure 5) which stud arrangements also provide throttle valves.

Each stud arrangement 66 comprises a sleeve 68 comprising a narrower portion 70 and a larger portion 72. The larger portion 72 is provided with a screw thread which extends to a faceted head 74, and the larger portion 72 is screwed into an appropriate screw threaded

bore in the front face 4 of the frame 2. A valve member 76 is mounted in th sleeve 68 and comprises a head 78 having a chamfered seating face 80 and mounted for sliding movement in the larger portion 72 of the sleeve 68, and a stem 82 which comprises a threaded portion 84 which engages in an internally threaded portion 86 of the narrower portion 70 of the sleeve 68. The valve members can thus be adjusted in the sleeve 68 by rotation of the members 76, achieved through use of a square head 88.

As can be seen from Figure 2, the stud arrangement 66 may be used in one of three contexts.

Vi wing the lower most stud arrangement 66 shown in Figure 2, this serves to provide a throttle valve for controlling the passage of air from the chamber 34 through the orifice 36 into the exhaust passage 10. The chamf r d face 80 is arranged opposite the orifice 36, and can be brought close to the orifice to restrict the flow of air from the valve 22 through the chamber 34 to exhaust, if required, by adjustment of the face 80 by rotation of the valve member 76.

The next lowest stud arrangement viewing Figure 2 is associated with a high pressure control sleeve 38. The sleeve 68 of the stud arrangement is screwed into the frame 2 and the end face of the larger portion 72 of the sleeve 68 engages the annular end face 52 of the sleeve 38 to hold the sleeve in place in the inlet passage 16. The head 78 of the valve member 76 is dimensioned to be slidable within the cylindrical wall 44, and thus by adjustment of the position of the valve member 76, specifically of the axial position of the head 78 with respect to the entry ports 48, it is possible to control the rate of flow of air from the high pressure passage 12, through the control sleeve 38 in the inlet passage 16 and out through the ports 48 into the chamber 32.

The next lowest stud arrangement viewing Figure 2 is associated with a low pressure control sleeve 40, and it can be seen that adjustment of the position of the valve member 76 will control the flow of low pressure air from the low pressure passage 14 through the entry ports 58, through the wall 56 of the control sleeve 40 and out through the ports 60 into a chamber equivalent to the chamber 32.

The stud arrangements 66 also provide for the accurate location of the valves 20 at each valve station. Each valve 20 is provided with two through bores 90,92 each provided with enlarged end portions 100,102,104,106. The valve 20 is positioned at a valve station by being positioned on two adjacent stud arrangements 66, extending through the bores 90 and 92. The enlarged portions 100 and 104 fit over the faceted heads 74 of the sleeve 68, the bores 90,92 closely surround the sle ves 68, and the enlarged portions 102,104 accommodate nuts 108 which ar secured on threaded nd portions of the sleeves 68 to hold the valve 20 firmly in position.

Each valve 20 is a pilot operated valve controlled by a solenoid operated pilot valve 110.

It can be seen that the valv block just described is highly adaptable and convenient of access. Each valve station 3 can b arranged to control high pressure air, by use of a sleeve 38 or low pressur air, by use of a sleeve 40. If, for example for [Plunger up operating air,] air at a pressure different from that of the main high pressure or low pressure air is required, such air may be provided to the valve block through a dedicated passage 112 (see Figure 5) and conveyed to the valve at the valve station through a simple sleeve 114 which does not connect to either the high pressure passage 12 or the low pressure passage 14. Thus each valve station may be modified, by variation of the control sleeves, or repaired, by replacement of the valve 20, with access only to one face of the valve block. Further, the stud arrangements 66 allow both the incoming air from the supply and the air passing to the exhaust from the valve 20 to be throttled; this throttling of air passing to exhaust allows conventional check valves to be dispensed with.

Claims

1. A valve block comprising

a frame (2) which provides a plurality of valve stations (3) arranged in one or more rows, the frame (2) having a front face (4) and a rear face (6) which provide a front face (4) and a rear face (6) of each valve station, an exhaust passage (8,10), a first pressure passage (12) and a second pressure passage (14) all extending lengthwise through all the valve stations in one row, and a control valve (20) associated with each valve station

characterised in that each valve station (3) comprises

an inlet passage (16) extending from the rear face (6) to the front face (4) of the station across the two pressure passages (12,14)

a supply passage (18) extending from the rear face (6) to the front face (4) of the station

a control sleeve (38,40) in the inlet passage (16) which connects a selected one only of the pressure passages (12,14) to an inlet (22) of the control valve (20) which control sleeve is accessible from the front face of the valve station

and in that the control valve (20) associated with the station is mounted on the front face (4) of the station

and throttle valves for controlling the passage of air to the valve (20) from the inlet passage (16) and from th valve to the xhaust passage (8,10) are also mounted on the front fac (4) of the station.

2. A valve block comprising

a frame (2) which provides a plurality of valv stations (3) arranged in one or more rows, the fram (2) having a front face (4) and a rear face (6) which provide a front face (4) and a r ar face (6) of each valv station, and an exhaust passage (8,10), a first pressure passage (12) and a second pressure passage (14) all extending lengthwise through all the valve stations in one row, a control valve (20) associated with each valve station and means for connecting the valve to the exhaust passage and selectively to one of the pressure passages

characterised in that

each valve station (3) comprises

an inlet passage (16) extending from the rear face (6) to the front face (4) of the station across the two pressure passages (12,14)

a supply passage (18) extending from the rear face to the front face of the station

a valve inlet passage (28) extending from the front face of the station and connected to the inlet passage (16)

a valve exhaust passage (30) extending from the front face of the station and connected to the exhaust passage (8,10)

a control sleeve (38,40) in the inlet passage which connects a selected one only of the pressure passages (12,14) to the valve inlet passage (28)

the control valve (20) associated with the valve station being mounted on the front face (4) of the valve station and comprising air passages which mate with the entrances in the front face of the supply passage (18), the valve inlet passage (28) and the valve exhaust passage (30).

3. A valve block comprising

a frame (2) which provides a plurality of valve stations (3) arranged in one or more rows, the frame (2) having a front face (4) and a rear face (6) which provide a front face (4) and a rear face (6) of each valve station and an exhaust passage (8,10), a first pressure passage (12) and a second pressure passage (14) all extending lengthwise through all the valve stations in one row, and a control valve (20) associated with each valve station,

characterised in that

each valve station comprising

an inlet passage (16) extending from the rear face (6) to the front face (4) of the station across the two pressure passages (12,14)

a supply passage (18) extending from the rear face (6) to the front face (4) of the station

a valve inl t passage (28) xt nding from the front face of the station and connected to the inlet passage (16)

a valve exhaust passage (30) extending from the front face of the station and connected to the exhaust passage (8,10)

a control sleeve (38,40) in the inlet passage which connects a selected one only of the pressure passages to the valve inlet passage

a first stud arrangement mounted on the front face of the station and extending into the inlet passage (16) to hold the control sleeve (38,40) in position

a second stud arrangement (66) mounted on the front face of the station

the valve (20) being located on the two stud arrangements (66) and comprising air passages which mate with the entrances in the front face of the supply passage, the valve inlet passage and the valve exhaust passage.

4. A valve block according to claim 2 wherein said control sleeve is accessible from the front face of the valve station.

5. A valve block according to any one of claims 1, 2, 3 and 4 wherein the valve stations are arranged in two rows.

6. A valve block according to claim 5 wherein the two pressure passages extend through the valve stations in both rows.

7. A valve block according to claim 2 comprising throttle valves for controlling the passage of air to the control valve from the inlet passage and from the control valve to the exhaust passage, which throttle valves are mounted on the front face of the valve station.

8. A valve block according to claim 4 comprising a first stud arrangement mounted on the front face of the valve station and extending into the inlet passage to hold the control sleeve in position

a second stud arrangement mounted on the front face of the station

the control valve being located on the two stud arrangements.

9. A valve block according to claim 8

wherein the first stud arrangement provides a

throttle valve for controlling the passage of air from the inlet passage to the control valve and the second stud arrangement provides a throttle valve for controlling the passage of air from the control valve to exhaust.

10. A valve block according to claim 3 wherein the first stud arrangement 66 comprises a control face which can be adjusted with respect to the control sleeve thus to provide a throttle valve.

11. A valve block assembly according to one of claims 3 and 10 wherein the second stud arrangement comprises a control face which can be adjusted with respect to an inlet hole in a wall of the exhaust passage thus to provide a throttle valve.

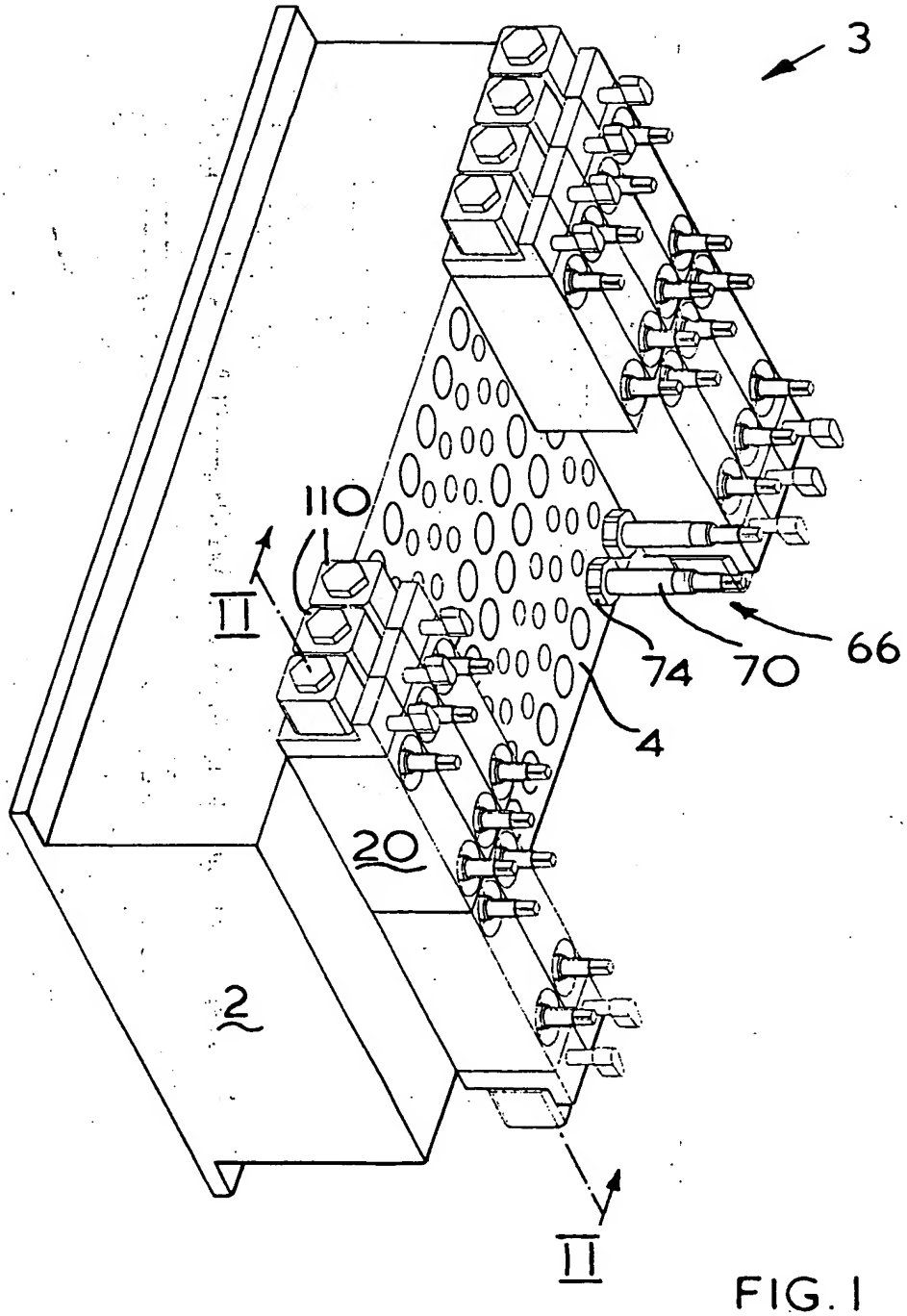

FIG. 1

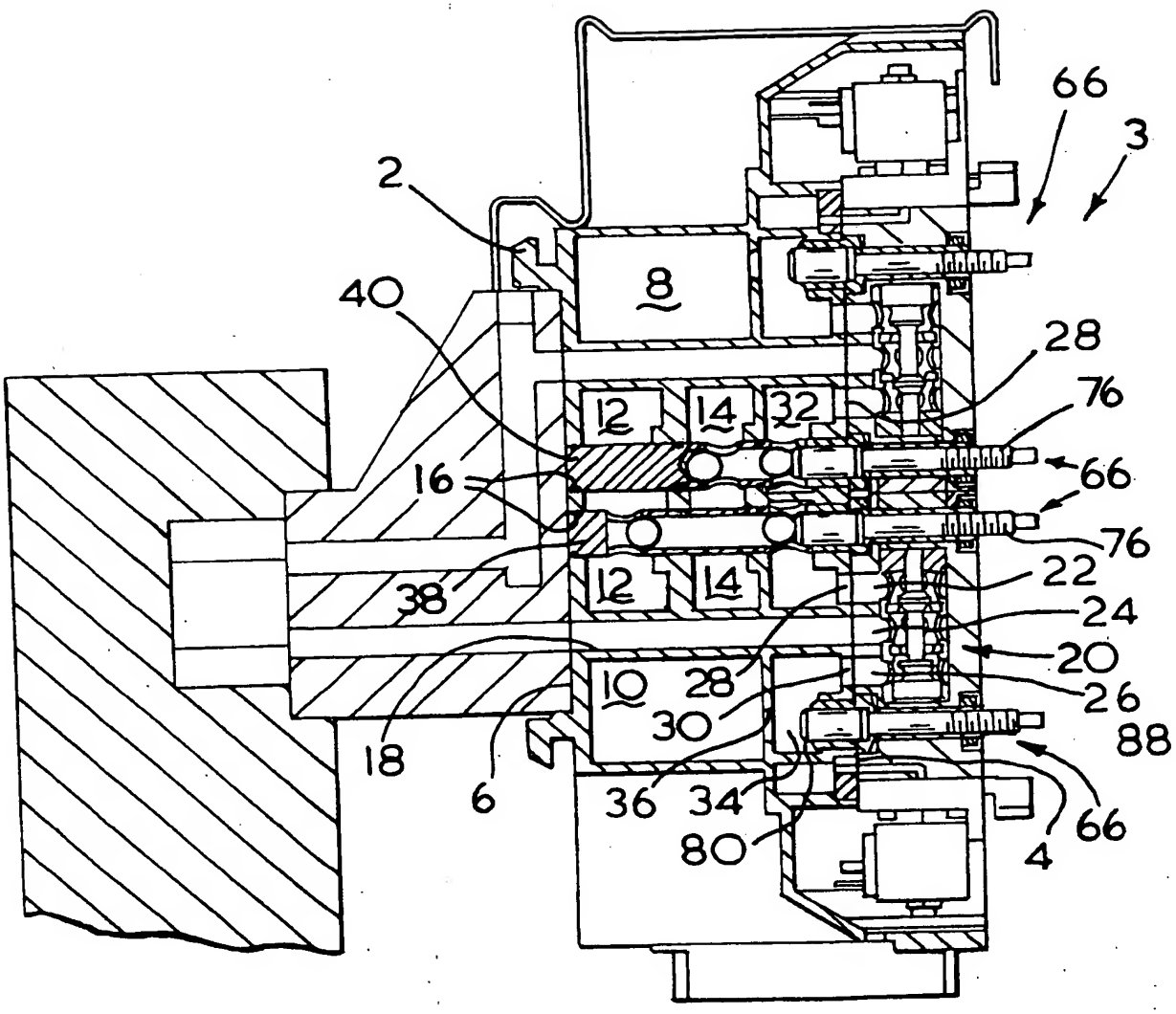
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FIG. 2

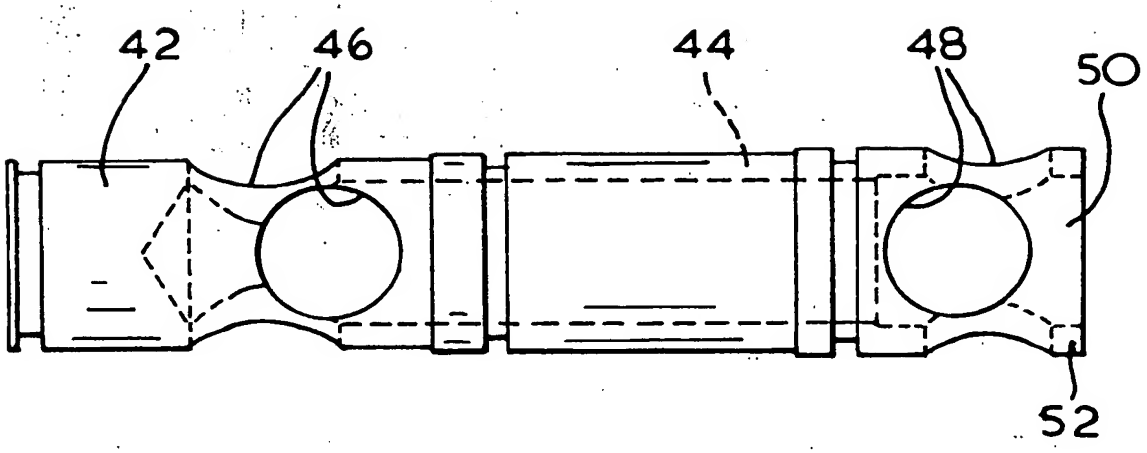

FIG. 3

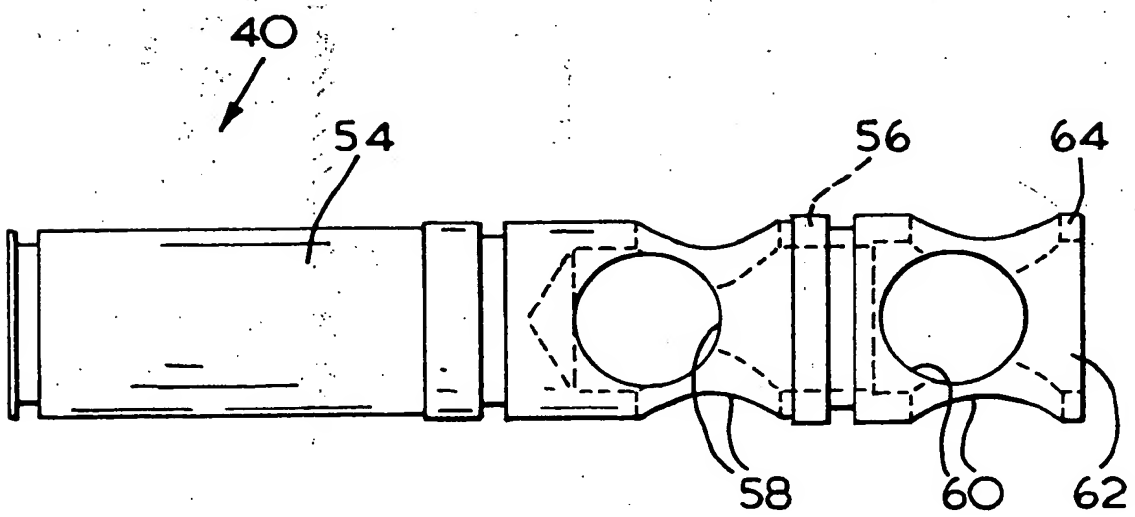

FIG. 4

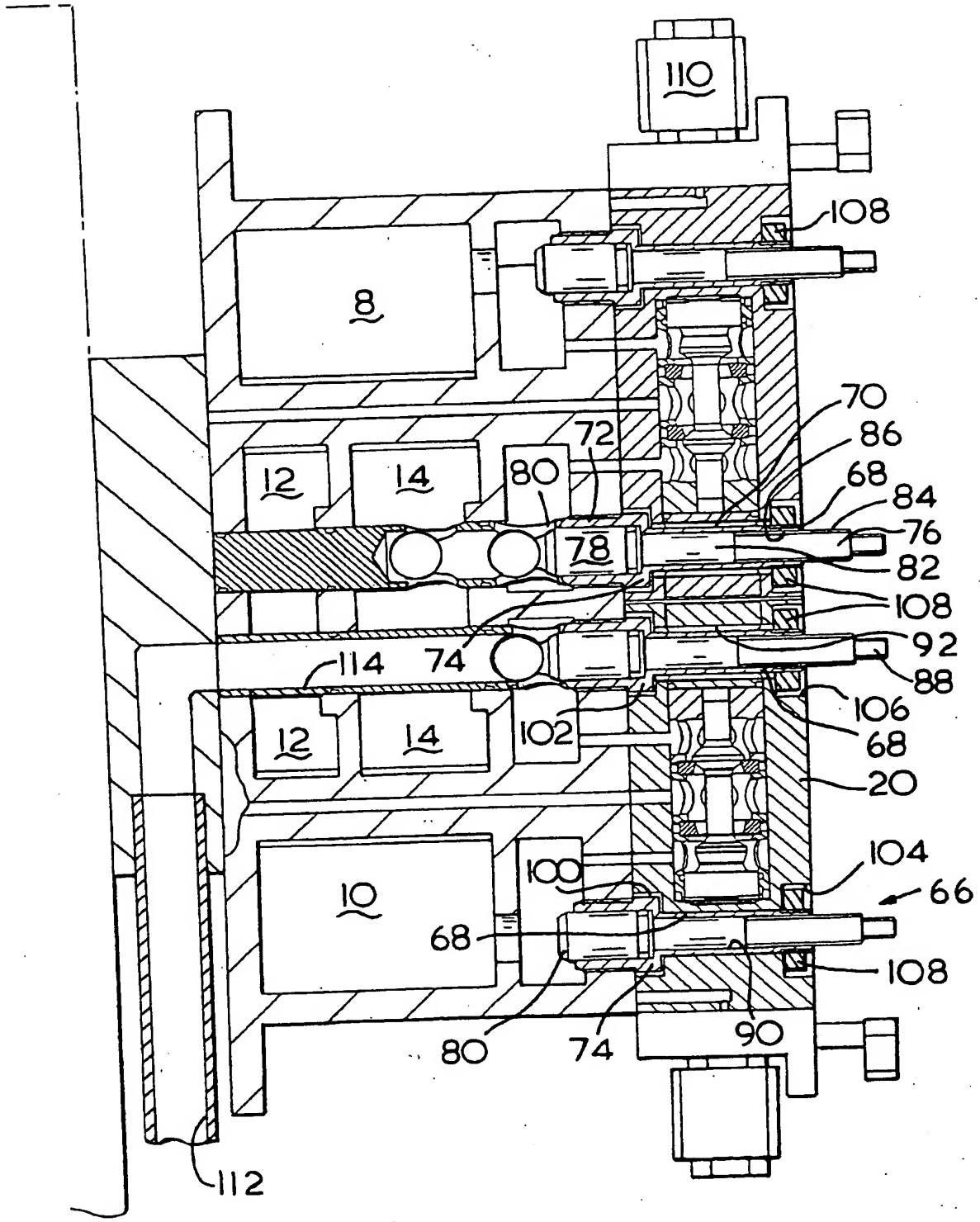
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FIG. 5